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Method used to identify previously undiagnosed infections in the HIV outbreak at Glenochil prison

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SUMMARY

Four years after the occurrence of an outbreak of hepatitis B and HIV infection among injecting drug user inmates at Her Majesty's Prison Glenochil in Scotland, a study design was developed to complete the epidemiological account of the HIV outbreak. Our aim was to identify potential cases of (1) HIV transmission not diagnosed during the original outbreak investigation and (2) the source(s) of the outbreak. Scotland's HIV positive case register was searched for matches to a soundexed list of 636 Glenochil inmates imprisoned during January–June 1993. Eight HIV infections that may have been acquired in Glenochil and four possible sources of the outbreak were identified. The second stage of follow-up – molecular epidemiological techniques used on stored sera samples from identified individuals – is described in the companion paper. Without breach of medical or prisoner confidentiality, indirect and anonymous follow-up has proved possible for the Glenochil inmates.

INTRODUCTION

Hepatitis B and HIV infections were transmitted during January–June 1993 inside Her Majesty's Prison (HMP) Glenochil, Scotland [1–3]. Symptomatic cases of acute hepatitis B infection were first evident in April 1993 and overt HIV seroconversion illness followed in at least two men. These observations precipitated a public health response [2]. HIV counselling and testing were offered by an external healthcare team to 378 inmates over a 2-week period beginning at the end of June 1993, during which time an embargo was placed on the movement of prisoners to and from other prisons. Prior to the exercise,

however, other prisoners had been released or transferred from HMP Glenochil to other prisons; a total of 636 men had been inmates in HMP Glenochil at some time between 1 January and 30 June 1993.

During the June–July 1993 infection control exercise at HMP Glenochil, 227/378 (60%) prisoners accepted counselling but only 162 (25% of the 636 inmates in Glenochil during the critical period) proceeded to personal HIV testing. Twelve of the 162 tested were diagnosed HIV seropositive, and a further 12 with HIV antibody negative results could have been sampled during the interval between HIV acquisition and seroconversion when HIV antibodies are not always detectable [2].

The medical team at HMP Glenochil and the

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external healthcare team between them diagnosed 14 cases of HIV infection. Based on dates of HIV test results in relation to time of entry into the prison, six transmissions definitely occurred within Glenochil [2]. Molecular epidemiological techniques subsequently demonstrated that 13 of the 14 had acquired their infection from a common source [4]. Two previously known HIV infected inmates possessed viral sequences which were unrelated to those seen in the Glenochil cohort, and so the source of the outbreak was either an unidentified Glenochil inmate or one of the 13 cases who acquired his infection prior to being incarcerated in Glenochil. One of the 14 HIV positive cases was clearly infected with a different virus. An early banding pattern on western blot, characteristic of seroconversion, showed that he was infected at the same time as the others, but not from the same source. Although no sex between men was reported from the Glenochil survey, molecular analyses revealed that viral sequences from this patient were closely related to sequences obtained from Scottish gay men; this finding suggested that this patient acquired his infection from a different source to that of the other cases [4].

A year later, in July 1994, Willing Anonymous Salivary HIV (WASH) surveillance with risk factor elicitation was conducted at HMP Glenochil in which 295 (84%) out of 352 prisoners participated [5]. More than half the July 1994 inmates (150/284) were also in Glenochil prison during January–June 1993; 44/149 of them (30%) were injecting drug users, half of whom had injected in HMP Glenochil during the first 6 months of 1993 (23/44). On testing for HIV, of saliva samples, 7/293 gave positive results – 4 were presumed to be from inmates known to be infected with HIV, and the others from injecting drug users all of whom had been in Glenochil during the critical period when 2/3 had tested negative for HIV. It was estimated that between a quarter and a third of men who had injected drugs in Glenochil in January–June 1993 were infected with HIV – at least 20 cases [5].

In the context of these findings, we sought to determine if additional HIV infections which had been acquired during January–June 1993 inside Glenochil prison had subsequently been diagnosed and also to further investigate the source(s) of the outbreak. We developed a method which allowed us to follow-up the 636 former prisoners from Glenochil whilst maintaining prisoner and patient confidentiality. We describe the process by which, to the end of 1997, we identified 12 cases for further investigation.

The molecular investigation of these men is described in the companion paper [7].

METHODS

Compiling the list of men incarcerated in Glenochil, January–June 1993

A list of key identifiers for all men who had been incarcerated in Glenochil at some time between January and June 1993 was required in order to link cases with other database sources. The list consisted of forename initial, surname soundex and date of birth details for each of the 636 male prisoners and was compiled at the end of 1996 at HMP Glenochil by:

- (a) Creating a list of inmates currently at Glenochil (at the end of 1996) who were also incarcerated there during January–June 1993.
- (b) Documenting all liberations and transfers of Glenochil prisoners from 1 January 1993 to when list (a) was compiled; admission and transfer dates of prisoners liberated or transferred after 30 June 1993 were checked to see whether or not they were in Glenochil during January–June 1993.
- (c) Merging lists (a) and (b) to give a comprehensive list of all inmates in Glenochil at some time during January–June 1993.

To safeguard the confidentiality of these prisoners, the surname of each individual was converted into soundex code within Glenochil. The soundex of a surname is its first letter followed by three digits. The mapping of letters onto numbers is designed so that names which sound alike map onto the same soundex. Thus Gore, Gair, Gere, all have soundex G600 because the letter r maps onto the digit 6, vowels are ignored and trailing zeros make up the 3-digit code when there are insufficient consonants.

Identifying HIV infections that may be related to the Glenochil outbreak in January–June 1993

Scotland's HIV positive case register, held at the Scottish Centre for Infection and Environmental Health (SCIEH), features surname soundex, forename initial, date of birth, gender, exposure category, date of HIV positive test result, source of test, laboratory

where tested and laboratory test number for all individuals in Scotland who have been diagnosed HIV positive. We searched the register up to January 1997 for the occurrence of gender plus date of birth plus surname soundex plus forename initial matches to the soundexed list of 636 male Glenochil prisoners.

Identifiers of prisoners who were possible matches were then searched against another SCIEH database [6], which holds information on all persons in Scotland who have tested HIV negative since 1989, to establish if the case was a match for an inmate testing negative for HIV infection before, during or after the January–June 1993 outbreak period. Identifying HIV positive or negative test results and their dates would help to determine if the case had possibly or definitely acquired his infection before, during or after incarceration in Glenochil during January–June 1993; those diagnosed HIV positive in the before outbreak category would be considered a possible source of infection.

Ethical committee approval

The above methods were approved by the ethical committee of the Forth Valley Health Board area in which HMP Glenochil is sited.

RESULTS

Identifying HIV infections that may have been acquired in Glenochil

Matching the list of Glenochil inmates to Scotland's HIV and AIDS diagnosis Register from January 1993 to January 1997 produced, apart from the 14 known Glenochil HIV infections, 8 HIV positive males whose date of birth is identical to 8 of the 636 Glenochil prisoners and who are reported injecting drug users (Table 1). Of the 8, none was a complete match for other identifiers – surname soundex and forename initial – with only one match for surname soundex. Two patients (Table 1: cases C1 and C2) progressed quite rapidly (5 and 29 months respectively) from HIV diagnosis to death. Of the 8 cases, 3 (cases C6–C8) had been tested antibody negative for HIV infection at the end of the Glenochil critical period (case C6 at HMP Shotts, and the other two at the Glenochil Infection Control Exercise). These antibody negative tests could have been taken during the interval between HIV acquisition and seroconversion when HIV antibodies are not always detectable and so we have retained the

matched HIV positive cases in the study for further investigation.

Identifying further possible sources of the HIV outbreak

Matching the list of Glenochil inmates to Scotland's HIV and AIDS diagnosis Register up to January 1993 produced, apart from the two known putative sources S1 and S2 [4], four HIV positive males who share the same date of birth and surname soundex as Glenochil prisoners and who are reported as injecting drug users (Table 1).

DISCUSSION

The outbreak of HIV at Glenochil prison during January–June 1993 is already well documented because of the infection control exercise in June–July 1993, WASH surveillance in July 1994, phylogenetic analyses and Human Leukocyte Antigen (HLA) typing of members of the Glenochil cohort, several of whom have shown rapid HIV progression in association with A1-B8-DR3 phenotype [1–5]. It was estimated that at least six inmates became HIV infected during the outbreak and remained undiagnosed following the infection control testing and counselling exercise in June–July 1993 [5]. We sought to corroborate this estimate by initially counting potential new HIV diagnoses for the 636 former Glenochil inmates.

This data linkage study discovered eight males who share the same date of birth as former Glenochil prisoners and who were diagnosed HIV positive between January 1993 and January 1997, with route of transmission reported as injecting drug use. In addition we were able to account for further possible sources of the HIV outbreak by searching the Scottish HIV positive case register up until the outbreak in January 1993; we found four males who share the same date of birth and surname soundex as former Glenochil prisoners and who were reported injecting drug users. None of the 12 cases had previously been related to the original cohort (i.e. the 13 injectors commonly infected in HMP Glenochil or that of the 14th injector who seroconverted in HMP Glenochil but acquired his infection from a different source).

Scotland's HIV positive case register will be searched periodically to the end of June 2008 by which time any infected cases attributed to the Glenochil

Table 1. *Characteristics of 12 HIV positive males (excluding all the original 14 cases identified in 1993) derived from Scotland's HIV and AIDS diagnosis register whose date of birth matched with that of 1 of the 636 prisoners of HMP Glenochil who were incarcerated at some time during the January–June 1993 period of the HIV outbreak*

Case	Identifiers matched to HIV register			Last HIV negative test date* (month/year)	HIV diagnosis test date (month/year)	Months during first half of 1993 in Glenochil
	Surname soundex	Forename initial	Reported risk behaviour			
HIV infections that may have been acquired in Glenochil						
C1	Yes	No	IDU	NK	06/96	Jan.
C2	No	No	IDU	NK	11/93	Jan.–June
C3	No	No	IDU	06/85	03/93	Jan.–June
C4	No	No	IDU	NK	07/96	Jan.–June
C5	No	No	IDU	02/93	01/95	Jan.–June
C6	No	No	IDU	07/93	07/96	Jan.–May
C7	No	No	IDU	07/93†	12/93	Jan.–June
C8	No	No	IDU	07/93†	05/96	Jan.–June
Possible sources of the HIV infection						
S3	Yes	Yes	IDU	04/86	09/88	Jan.–May
S4	Yes	Yes	IDU	NK	10/92	Jan.–May
S5	Yes	Yes	IDU	NK	06/84	Jan.–June
S6	Yes	No	IDU	NK	03/85	Jan.–June

* Last HIV negative test date of either identified case or matched prisoner.

† HIV test taken at Glenochil infection control exercise in June–July 1993.

IDU, injecting drug use.

NK, Not known.

outbreak would be 15 years from the time of seroconversion and likely to have become clinically manifest. By then we shall have achieved anonymous but virtually complete follow-up of the 636 former inmates in respect of HIV diagnosis.

The next stage of this follow-up investigation, presented in the companion paper [7], would verify any association with the original cohort by examining viral sequence from stored sera for each of the 12 identified cases. The stored samples would be located through SCIEH supplying the laboratories with the laboratory numbers attached to the 12 HIV diagnostic test records held on SCIEH's HIV positive case register. Stored sera, once located, would then be stripped of all identifiers, other than laboratory number and forename and surname initials, and sent for molecular sequencing. The laboratory number and initials information would allow the linkage of a specimen to its corresponding epidemiological details held at SCIEH. At no stage of the proceedings would any name or address information be held by the study investigators.

This investigation could not have been performed without the existence of a comprehensive HIV case

register. In Scotland, all HIV testing laboratories report details of HIV positive diagnoses to SCIEH on a monthly basis. Outside the rest of the UK and a few of the smaller western European countries, registers either do not have nation-wide coverage or the data collected on each case is extremely limited. We suggest that the database linkage method which we employed to complete the epidemiological account of the HIV outbreak at Glenochil prison could be applied more generally in the investigation of transmission networks for communicable diseases in other settings.

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